

A Forensic Anthropology Activity

Anthropology is defined as “the scientific study of the origin, the behavior, and the physical, social, and cultural development of humans”¹ and an anthropologist is the scientist who specializes in anthropology. Whenever a violent crime is committed, it is up to a **forensic anthropologist** to “apply standard scientific techniques developed in physical anthropology to identify human remains, and to assist in the detection of crime.”² In other words, forensic anthropologists can tell the approximate height, age, gender, and nationality of the person whose remains have been recovered.

In this activity, we’re going to discover how forensic anthropologists do some of this. Forensic anthropologists prefer to use the femur bone in the thigh since it is the largest bone in the body, but we will be using the humerus bone in the upper arm.

Materials

- Tape measures
- Graph paper
- Rulers
- Pencil

Procedure

Everyone should read all of the steps before beginning.

Step 1

Break into groups of three or four. For each person in the group, **two measurements will be taken**:

1. the length of the upper arm limb (the humerus), and
2. the height of each person.

For the measurement of the humerus, bend the subject's arm at the elbow and feel the **tuberosity**, or "knot," on the side of the elbow. This is essentially one of the ends of the humerus. Also, feel at the shoulder a similar "knot;" this should be the top of the humerus. Carefully measure the entire length of this bone. Then measure the subject's height very carefully. Record this data for each person before you begin the next step.

Step 2

The data for each person should include the two measurements. Graph the data with the length of the humerus along the x-axis and the subject's height along the y-axis. Once all of the data is graphed, draw a straight line along the data points and extend it so that your line intersects with the y-axis. This point will be the **y-intercept**. Next determine the **slope** of the line based on the model in Figure 11. Finally, determine the equation of your line.

Step 3

After each group has completed their data collection and has determined the equation for their lines, it will be time to determine which group came up with the **most accurate equation**.

Select two or three "new" people from another group and switch them with two or three members of your own group. Select people of different heights. Each group will then measure the length of the humerus bone for each of the "new" persons and determine their height using two methods:

1. **Using your graphs**, your group will **estimate** height, and
2. **Using your line equations**, each group will **calculate** each new person's height.

Record this data. Then **measure** the person's height to see how closely your **graph and your line equation** were able to predict the height of these students. Which group came up with the most accurate graph? Which group came up with the most accurate line equation?

Step 4

Based on your experiences, each group must answer the following questions.

Questions

1. What are the sources of error that might have been responsible for:

- data points not lining up _____
- the graph not being accurate enough to estimate the "new" person's height

- the equation not being accurate enough to calculate the "new" person's height

2. What kind of sample population would yield the best set of data points and, therefore, the best line equation? _____

According to one source, the following formulas are accurate for the relationship between the length of the humerus and the height of a person of a certain gender:

$$\text{Male (in cm)} = 2.89 \cdot (\text{length of humerus}) + 70.64$$

$$\text{Female (in cm)} = 2.75 \cdot (\text{length of humerus}) + 71.48$$

3. How close to one of the above equations did your group come?

Activity from <http://www.nsbri.org/HumanPhysSpace/focus6/student1.html>

1. From <http://www.dictionary.com>

2. From <http://faculty.ncwc.edu/toconnor/425/425lect17.htm>

Formulas for relating bone length to height:

Female: $1.95 * \text{femur} + 72.85$ (in cm)

Female in inches = $(1.880 * \text{femur length}) + 32.010$

Male in inches = $(1.945 * \text{femur length}) + 28.679$

Male (in cm) = $2.89 * \text{humerus} + 70.64$

Female (in cm) = $2.75 * \text{humerus} + 71.48$